

CLAIMS

1. A mutant *Neisseria meningitidis* ADP-ribosylating enzyme, wherein the mutant has a substitution at one or more of amino acids Glu-109, Glu-111 or Glu-120.
2. The mutant enzyme of claim 1, wherein the mutant has reduced or eliminated
5 ADP ribosyltransferase and/or NAD-glycohydrolase activity relative to the wild-type enzyme, wherein the wild-type enzyme has amino acid sequence SEQ ID NO: 1.
3. The mutant enzyme of claim 1 or claim 2, wherein the mutation(s) is/are preferably Glu to Asp.
4. The mutant enzyme of any preceding claim, wherein the enzyme comprises one of the amino acid sequences SEQ ID NO: 2, SEQ ID NO: 3 or SEQ ID NO: 4.
- 10 5. A protein comprising a fragment of a *Neisseria meningitidis* ADP-ribosylating protein, wherein (i) the fragment includes one or more of amino acids Glu-109, Glu-111 or Glu-120 from said ADP-ribosylating protein, and (ii) one or more of said amino acids Glu-109, Glu-111 or Glu-120 is substituted.
6. The protein of claim 6, wherein the Glu-109, Glu-111 or Glu-120 is substituted with Asp.
- 15 7. The protein of claim 6 or claim 7, wherein the fragment comprises at least 7 consecutive amino acids from the toxin or mutant toxin.
8. The protein of any preceding claim, for use as an immunogen.
9. The protein of any preceding claim, for use as a parenteral or mucosal vaccine adjuvant.
10. Use of the protein of any one of claims 1 to 7, in the manufacture of a medicament for raising an
20 immune response in an animal.
11. An immunogenic composition comprising the protein of any one of claims 1 to 7 in admixture with a second antigen.
12. An antibody which binds to the protein of any one of claims 1 to 7, wherein the antibody binds to an epitope which includes one or more of amino acids Glu-109, Glu-111 or Glu-120.
- 25 13. Nucleic acid encoding the protein of any one of claims 1 to 7.
14. A method of treating a patient, comprising administering a therapeutically effective amount of the protein of any one of claims 1 to 7 and/or the nucleic acid of claim 13 and/or the antibody of claim 12.
15. A process for diminishing the ADP-ribosylating enzymatic activity of a *N.meningitidis* ADP
30 ribosyltransferase protein, comprising mutating amino acid residue 109, 111 and/or 120 of said protein.